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EXAMINER	
SWERDLOW, DANIEL	

ART UNIT	PAPER NUMBER
2644	4

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/584,576	GRAUMANN, DAVID L.	
	Examiner	Art Unit	
	Daniel Swerdlow	2644	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *26 February 2004*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-13 and 15-26* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *17* is/are allowed.

6)☒ Claim(s) *1-13,16 and 18-26* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1 through 6, 15, 16, 18 through 20, 22 and 23 are rejected under 35 U.S.C. 102(b) as being anticipated by Karlsen et al. (WO9715124A1).

3. Regarding Claim 1, Karlsen discloses an **echo canceller** (Fig. 4) comprising: an **adaptive filter** (Fig. 4, reference 12; p. 7, lines 8-9; p. 5, lines 2-3) that is updated continuously (i.e., **generates a current echo model**); decision logic (Fig. 4, reference 24; p. 7, lines 13-16) that corresponds to the **convergence metric computation unit** claimed; and a programmable filter (Fig. 4, reference 18; p. 7, lines 8-16) that corresponds to the **model store** claimed and into which the adaptive filter can be copied (i.e., **store the current echo model from the adaptive filter as a saved model**) under control of (i.e., **in response to an indication from**) the decision logic (Fig. 7, step 730; p. 7, lines 14-16; p. 10, lines 27-30) that corresponds to the **convergence metric computation unit** claimed.

4. Regarding Claim 2, Karlsen further discloses comparison between the adaptive filter output quality (Fig. 7, step 530, q_a) and the programmable filter output quality (Fig. 7, step 530, q_p) which, because the filters operate on the same input signal (Fig. 4, reference x(n)) constitutes a **measure of the** difference (i.e., **distance) between the respective filter models**; and determination of whether the difference exceeds a

threshold (i.e., **threshold comparison**) (Fig. 7, step 530, B) as part of the determination of whether the programmable filter is copied to the adaptive filter (i.e., **to facilitate restoring the saved model as the current echo model**) (Fig. 7, step 760).

5. Regarding Claim 3, Karlsen further discloses **coefficients being copied from the** adaptive filter that corresponds to the **current echo model** claimed **to the** programmable filter that corresponds to the **model store** claimed (Fig. 7, step 730; p. 7, lines 27-28) which inherently involves transferring and **storing a subset of the coefficients** since any set is a subset of itself.

6. Regarding Claim 4, Karlsen further discloses the decision logic (Fig. 4, reference 24) that includes the function corresponding to the **distance measurement unit** claimed **coupled between the adaptive filter** (Fig. 4, reference 12) **and the** programmable filter (Fig. 4, reference 18) that corresponds to the **model store** claimed to receive the inputs for (i.e., **facilitate**) the comparison (Fig. 7, reference 530) that corresponds to **the distance measurement** claimed at each sample time (i.e., **over a plurality of time lags**) (Fig. 7, reference 500; p. 8, lines 13-16).

7. Regarding Claim 5, Karlsen further discloses copying the programmable filter to the adaptive filter (i.e., **restoring the saved model as the current echo model**) (Fig. 7, step 760).

8. Regarding Claim 6, Karlsen further discloses **distance measurement** as shown apropos of Claim 2, above. In addition, Karlsen discloses this **measurement** at each sample time (i.e., **over a plurality of time lags**) (Fig. 7, reference 500; p. 8, lines 13-16). Further, Karlsen discloses immediately (i.e., **at a matching time lag**) copying the programmable filter to the adaptive filter (i.e., **restoring the saved model as the current**

model) (Fig. 7, reference 760) under control of **a comparison** (Fig. 7, reference 740) **coupled to** the comparison (Fig. 7, reference 530) that corresponds to **the distance measurement** claimed.

9. Regarding Claim 15, Karlsen discloses comparison between the adaptive filter (i.e., current model) output quality (Fig. 7, step 530, q_a) and the programmable filter (i.e., stored model) output quality (Fig. 7, step 530, q_p) which, because the filters operate on the same input signal (Fig. 4, reference x(n)) constitutes **comparing the current model with the stored model**; and determination of whether the difference (i.e., **distance**) exceeds a threshold (i.e., **matches** a value less than the threshold) (Fig. 7, step 530, B) as part of the determination of whether the programmable filter is copied to the adaptive filter (i.e., **replacing the current model with the stored model when a match is found**) (Fig. 7, step 760). Further, since the adaptive filter continues to adapt (i.e., converges), copying the programmable filter to the adaptive filter results in **reconverging**. Karlsen further discloses **determining a** quality measure (i.e., a **convergence metric value that describes a level of convergence) of the adaptive filter** (Fig. 7, step 510) **and** comparing the quality measure of the adaptive filter with the quality measure of the programmable filter (i.e., **comparing the current model with the stored model)** (Fig. 7, reference 530) **when the** quality measure of the adaptive filter (i.e., **convergence metric**) **is above a threshold**.

10. Regarding Claim 16, Karlsen further discloses dividing the adaptive filter input signal (Fig. 4, y(n)) by the adaptive filter output power (Fig. 4, $e_a(n)$) (equation 4) (i.e., **computing a ratio of adaptive filter output power to input power) to** determine adaptive filter quality (i.e., **determine convergence metric value**).

11. Regarding Claim 18, Karlsen discloses: **detection of** the programmable filter performing more poorly than the adaptive filter (i.e., **a real-time error**) (Fig. 7, step 530) leading to copying the adaptive filter to the programmable filter (i.e., **saving the current echo model as a saved model in a model store**) (Fig. 7, step 730); continuously updating the adaptive filter (i.e., **resetting the adaptive filter such that convergence begins anew**) (p. 5, lines 2-3); **comparing** the quality of the adaptive filter and the programmable filter (i.e., **the emerging model with the saved model**) (Fig. 7, step 530); and determination of whether the difference exceeds a threshold (i.e., **matches** a value less than the threshold) (Fig. 7, step 530, B) as part of the determination of whether the programmable filter is copied to the adaptive filter (i.e., **replacing the emerging model with the saved model when a match is found**) (Fig. 7, step 760). Further, since the adaptive filter continues to adapt (i.e., converges), replacing the emerging model with the saved model results in **reconverging**.

12. Regarding Claim 19, Karlsen further discloses dividing the adaptive filter input signal (Fig. 4, y(n)) by the adaptive filter output power (Fig. 4, $e_a(n)$) (equation 4) (i.e., **comparing adaptive filter input and output power**) to determine adaptive filter quality such that a **greater output power indicates** poor adaptive filter quality (i.e., **a real-time error**).

13. Regarding Claim 20, Karlsen discloses copying the programmable filter to the adaptive filter (Fig. 7, reference 760) as a result of the adaptive filter quality decreasing (i.e., **detecting real-time error**). Because the adaptive filter quality is inversely proportional to the error signal power $e_a^2(n)$ (Fig. 7, step 510; equation 4) this process is

triggered by an increase in error signal power (i.e., **when an inversion in echo return loss enhancement occurs abruptly**).

14. Regarding Claim 22, Karlsen discloses this **comparing** model quality (i.e., computing distance between models) at each sample time (i.e., **for each of a plurality of time lags**) (Fig. 7, reference 500; p. 8, lines 13-16). Further, Karlsen discloses immediately (i.e., **at a matching time lag**) copying the programmable filter to the adaptive filter (i.e., **restoring the saved model as the current model**) (Fig. 7, reference 760).

15. Regarding Claim 23, Karlsen discloses immediately (i.e., **shifted by the matching time lag**) copying the programmable filter to the adaptive filter (i.e., **replacing the emerging model with the saved model**) (Fig. 7, reference 760).

Claim Rejections - 35 USC § 103

16. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

17. Claims 7 through 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rigstad et al. (US Patent 6,044,150) in view of Karlsen.

18. Regarding Claim 7, Rigstad discloses a **speakerphone** (Fig. 6: column 11, lines 9-47) **comprising**: a digital to analog converter (i.e., **output device**) (Fig. 6, reference 68: "D/A") **to drive a speaker** (Fig. 6, 32) **responsive to a** node (Fig. 6, reference 70: summing junction output) that corresponds to the **reference node** claimed and is **coupled**

to the PSTN (i.e., **a communications channel**); an analog to digital converter (i.e., **input device**) (Fig. 6, reference 68: "A/D") **responsive to a microphone** (Fig. 6, reference 30); **an echo cancellation** module (i.e., **unit**) (Fig. 6, reference 268) **coupled to the** node that corresponds to the **reference node** claimed **and** the analog to digital converter that corresponds to **the input device** claimed **to use data from the** node that corresponds to the **reference node** claimed **to remove echo from the signal received at the microphone**. Therefore, Rigstad anticipates all elements of Claim 7 except a model store to store a current echo model when a real time error occurs. Karlsen discloses a programmable filter (Fig. 4, reference 18; p. 7, lines 8-16) that corresponds to the **model store** claimed and receives coefficients from an adaptive filter (i.e., **stores a current echo model**) when the programmable filter performs poorly (i.e., **when a real-time error occurs**) (Fig. 7, step 730; p. 11, lines 1-6). It would have been obvious to one skilled in the art at the time of the invention to apply coefficient storing as taught by Karlsen to the speakerphone taught by Rigstad for the purpose of having available a set of coefficients that are known to provide a good quality output signal.

19. Regarding Claim 8, Rigstad further discloses the **speakerphone implemented in a computer** (column 5, line 66 through column 6, line 3) and **the echo canceller implemented in software** (column 11, lines 25-27). Further, Rigstad discloses the A/D converter that corresponds to **the input device** claimed **and** the modem that contains the summing junction whose output corresponds to **the reference node** claimed contained within the computer (Fig. 3, reference 68, 70; column 7, lines 20-21, 55-56), which inherently **couples them to the echo canceller using memory in the computer**.

20. Regarding Claim 9, Karlsen further discloses detection of the programmable filter performing more poorly than the adaptive filter (i.e., **a real-time error detector**) (Fig. 7, step 530) leading to copying the adaptive filter to the programmable filter (i.e., **directing the model store to receive the current echo model to create a saved model**) (Fig. 7, step 730).

21. Regarding Claim 10, Karlsen further discloses dividing the adaptive filter input signal (Fig. 4, y(n)) by the adaptive filter output power (Fig. 4, $e_a(n)$) (equation 4) (i.e., **comparing adaptive filter input and output power**) **to** determine relative filter performance (i.e., **detect real-time error**).

22. Regarding Claim 11, Karlsen further discloses **comparing** the quality of the adaptive filter and the programmable filter (i.e., **the current echo model with the saved model**) (Fig. 7, step 530).

23. Regarding Claim 12, Karlsen further discloses **comparing** the quality of the adaptive filter and the programmable filter (i.e., **the current echo model with the saved model**) at each sample time (i.e., **over a plurality of time lags**) (Fig. 7, reference 500; p. 8, lines 13-16). Further, Karlsen discloses immediately (i.e., **at a matching time lag**) copying the programmable filter to the adaptive filter (i.e., **replacing the current model with the saved model**) (Fig. 7, reference 760).

24. Regarding Claim 13, Karlsen discloses copying the programmable filter to the adaptive filter (Fig. 7, reference 760) as a result of the adaptive filter quality decreasing (i.e., **detecting real-time error**). Because the adaptive filter quality is inversely proportional to the error signal power $e_a^2(n)$ (Fig. 7, step 510; equation 4) this process is

triggered by an increase in error signal power (i.e., **when an inversion in echo return loss enhancement occurs abruptly**).

25. Claims 24 through 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Karlsen in view of Rigstad.

26. Claims 24 through 26 are essentially similar to Claims 18, 22 and 19, respectively, with the exception that Claims 24 through 26 claim an article having a machine readable medium with instructions for performing the method. As stated above apropos of Claims 18, 22 and 19, Karlsen anticipates all elements of those claims. Therefore, Karlsen anticipates all elements of Claims 24 through 26 with the exception of an article having a machine readable medium with instructions for performing the method. Rigstad discloses implementing adaptive filtering functions in personal computer software (i.e., **an article having a machine readable medium with instructions for performing the method**) (column 11, lines 25-27). It would have been obvious to one skilled in the art at the time of the invention to apply personal computer implementation as taught by Rigstad to the method taught by Karlsen for the purpose of utilizing a natural platform for implementation of the method (Rigstad: column 1, lines 61-64).

27. Claim 21 is rejected under 35 U.S.C. 103(a) as being unpatentable over Karlsen in view of Yatrou et al. (US Patent 5,343,522). As stated above apropos of Claim 18, Karlsen anticipates all elements of Claim 21 except saving the portion of the echo model that includes a direct path and reverberations. Yatrou discloses modeling only the active

regions of the echo impulse response (i.e., **saving the portion of the echo model that includes a direct path and reverberations**) (column 2, lines 34-36). It would have been obvious to one skilled in the art at the time of the invention to apply modeling only the active regions of the echo impulse response as taught by Yatrou to the method taught by Karlsen for the purpose of simplifying the computation of the echo replica.

Response to Arguments

28. Applicant's arguments, see pages 9-10, filed 26 February 2004, with respect to Claim 17 have been fully considered and are persuasive. The rejection of Claim 17 has been withdrawn.

29. Applicant's other arguments filed 26 February 2004 have been fully considered but they are not persuasive.

30. Regarding Claims 1, 15 and 18, applicant alleges that Karlsen fails to disclose a convergence metric computation unit, a convergence metric value that describes a level of convergence or resetting the adaptive filter so that convergence begins anew. Examiner respectfully disagrees. As stated above and in the prior Office action, the decision logic disclosed by Karlsen corresponds to the convergence metric computation unit claimed. The decision logic calculates a measure of quality q_a of the adaptive filter based on the adaptive filter error signal $e_a(n)$. Since the error signal decreases as the adaptive filter converges, q_a is a metric of convergence. Further, since the adaptive filter continues to adapt (i.e., converges), replacing the emerging model with the saved model results in reconverging.

31. In response to applicant's argument with respect to Claims 7 and 24 that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992).

32. In this case, regarding Claim 7, Rigstad discloses a speakerphone that uses echo cancellation (Fig. 6). Karlsen discloses a method of improving the convergence of an echo canceller by using dual filters and a filter quality measurement (page 2, lines 16-25). As such, the motivation to combine is present in Karlsen.

33. Regarding Claim 24, Karlsen discloses a method for echo cancellation that anticipates all the steps in the claim. However, the claim claims an article having a machine readable medium with instructions for performing the method. Karlsen is silent as to a physical platform for the method, but one skilled in the art seeking to practice Karlsen's invention would seek an appropriate physical implementation for the functionality disclosed by Karlsen. Rigstad discloses a personal computer, inherently having a machine readable medium with instructions for performing a method, as a platform for echo cancellation. As such, one skilled in the art would have motivation to combine the teachings.

34. Applicant's arguments regarding Claims 2 through 6, 8 through 13, 16, 19 through 23, 25 and 26, based on their dependence from Claims 1, 7, 15, 18 and 24 are not persuasive for reasons stated above.

35. Regarding Claim 6, applicant argues that Karlsen does not disclose a distance measurement unit to compare the current echo model and the saved echo model. Examiner respectfully disagrees. As shown above apropos of Claims 1, 5 and 6, Karlsen discloses measurement of the difference (i.e., distance) between the adaptive and programmable filter models, and a comparison using this distance to determine copying the programmable filter to the adaptive filter (i.e., restore saved model as current model).

Allowable Subject Matter

36. Claim 17 is allowed.

37. The following is an examiner's statement of reasons for allowance:

38. Regarding Claim 17, Karlsen discloses comparing two echo models (i.e., vectors) by comparing their respective error signals and replica signals (Fig. 5, steps 510, 520). Bergmans discloses representing the difference between vectors as a Euclidean distance (column 5, lines 62-64). However, there is no teaching or suggestion to apply the concept of Euclidean distance to the comparison in Karlsen. Therefore the claim is allowable.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

39. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Daniel Swerdlow whose telephone number is 703-305-4088. The examiner can normally be reached on Monday through Friday between 8:00 AM and 4:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Forrester Isen can be reached on 703-305-4386. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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